

The Eastern Pacific Donacidae

BY

EUGENE COAN

Department of Invertebrate Biology and Paleontology, California Academy of Sciences
Golden Gate Park, San Francisco, California 94118

(7 Plates)

AS I PREPARED MY DISCUSSION of the two northwest American species of *Donax* (COAN, 1973b), I became aware that the nomenclature of the tropical eastern Pacific species was in a confused state and deserved critical attention. After examining the available type material of these species, as well as several large collections, I am now prepared to offer a revision of the family. I have also included information about the two species that occur in California.

The first two global reviews of the Donacidae were those of REEVE (1854-1855) and SOWERBY (1866). TRYON (1869) gave a listing of the species, and RÖMER (1869a) treated the species of *Iphigenia*. KÜSTER & RÖMER (1841-1870) also monographed the family, with all of the text issued by the latter (RÖMER, 1869b-1870). Finally, BERTIN (1881) monographed the family. Significant treatments of the tropical eastern Pacific species were those of HERTLEIN & STRONG (1949), KEEN (1958), OLSSON (1961), and KEEN (1971). A list of the species occurring in Peru was published by PEÑA (1971). A review of the western Atlantic species of *Donax* was prepared by MORRISON (1971).

It is important that such common and ecologically significant taxa as the Donacidae be brought up to date taxonomically. Otherwise, a great deal of confusion can occur in ecological and biogeographic studies. The errors in such studies cited in the discussions below also serve to show how important it is to retain voucher specimens in major institutions.

CONVENTIONS AND ABBREVIATIONS

In the following treatment, the correct name is followed by a synonymy, information on type specimens and localities, a description, notes on distribution, and, if necessary, an additional discussion.

The synonymies include all major accounts about the species, but not minor mentions in the literature. The entries are arranged in chronological order under each species-name, with changes in generic allocation and other notes provided in brackets.

The following are the abbreviations of institutions used in the text:

AMNH	— American Museum of Natural History
ANSP	— Academy of Natural Sciences of Philadelphia
BM(NH)	— British Museum (Natural History)
CAS	— California Academy of Sciences
LACM	— Los Angeles County Museum of Natural History
MCZ	— Museum of Comparative Zoology, Harvard University
MNHN	— Muséum National d'Histoire Naturelle, Paris
SBMNH	— Santa Barbara Museum of Natural History
SDNHM	— San Diego Natural History Museum
USNM	— United States National Museum of Natural History

The following are the other abbreviations used in the text:

<i>auctt.</i>	— of authors
Co.	— County
Coll.	— Collection
<i>ex...MS</i>	— from the manuscript of...
fig(s).	— figure(s)
h	— height (maximum ventral-dorsal dimension perpendicular to maximum length)
<i>in litt.</i>	— in correspondence
km	— kilometer(s)
l	— length (maximum anterior-posterior length)
M	— Monotypy
m	— meter(s)
mm	— millimeter(s)
Mus.	— Museum
<i>non</i>	— not of
OD	— Original Designation
pair	— the two valves of one individual
plt(s).	— plate(s)
Prov.	— Province
SD	— Subsequent Designation
sd	— standard deviation (based on measurements of 10 or more randomly selected adult specimens)
th	— thickness (maximum thickness of closed, paired valves)
var.	— variety
= ...	— junior synonym of ...

The term "lectotype herein" means that the lectotype is designated in this paper.

Donacidae Fleming, 1828

There are two genera in the Donacidae of the eastern Pacific—*Donax* and *Iphigenia*. (Some authors have recognized *Amphichaena* as a separate genus, but I rank it here as a subgenus of *Donax*.) The large shells of *Iphigenia* lack the radial structure and sculpture of *Donax*. *Iphigenia* also has scarcely evident lateral teeth, whereas *Donax* has prominent laterals.

For a listing of the genera of the Donacidae, see KEEN (1969).

Donax Linnaeus, 1758

[Type species: *Donax rugosus* Linnaeus, 1758; by SD of SCHUMACHER, 1817]

Radial sculpture and structure present, sometimes evident only as marginal crenulations; one or two lateral teeth prominent. All species marine.

In my 1973 paper, I gave a brief bibliography of papers on the functional morphology of *Donax*. In addition to those cited there, relevant works include TURNER & BELDING (1957), WADE (1967a,b; 1969), PENCHASZADEH & OLIVIER (1975), and ANSELL (1981).

Subdivision of *Donax* into meaningful subgenera is a task that remains for someone willing to make a study of all of the world's species. The roster of named subgenera is surprisingly brief, and there are some eastern Pacific species that have no convenient subgeneric homes. The naming of new subgeneric units must also await a global review.

As explained by Keen (1971: 236), the word "donax" in Latin is a masculine noun, which determines its usage as a scientific name. Thus, species-names in *Donax* that are adjectives must have masculine endings. Unfortunately, many early authors considered "donax" to be feminine. Here, the correct adjectival terminations are used, following the instructions of Article 30 (as revised in 1972) of the "International Code of Zoological Nomenclature." In

the synonymies, the original, incorrect spellings are given in brackets. Thus, *Donax* "*contusa*" becomes *D. contusus*.

Some authors assumed that the masculine equivalent of *-fera* was *-ferus*, whereas it is simply *-fer*. For example, OLSSON'S (1961) usage of *Donax dentiferus* should have been *D. dentifer*.

Finally, some species-names are nouns in apposition and do not change with the gender of the generic name. For this reason, *Donax navicula* and *D. scalpellum* are correct.

A Key to the Eastern Pacific Species of *Donax*

- (1a) Rib interspaces with fine punctations (over all or part of shell) 2
 (1b) Punctations not present 8
 (2a) Shell very short ($l/h = 1.3$); sculpture low
D. obesus
 (2b) Shell not so short ($l/h = 1.4-1.9$) (*D. ecuadorianus*, the next shortest species—1.4— has heavy sculpture) 3
 (3a) Shell elongate ($l/h = 2.0$) and generally flat ($th/h = 0.59$), though variable in shape *D. culter*
 (3b) Shell not so elongate ($l/h = 1.4-1.5$), more inflated ($th/h = 0.61-0.74$) 4
 (4a) Sculpture rugose *D. ecuadorianus*
 (4b) Sculpture subdued 5
 (5a) Pattern of punctations dipping toward ventral margin near anterior end *D. obesulus* (part)
 (5b) Punctations regularly deployed in interspaces 6
 (6a) Punctations present near posterior end
D. punctatostriatus
 (6b) Punctations replaced by fine concentric lines near posterior end 7
 (7a) Less inflated ($th/h = 0.67$); sculpture prominent to ventral margin; Mexico & Central America *D. caelatus caelatus*
 (7b) More inflated ($th/h = 0.73$); sculpture obsolete near ventral margin; South America
D. caelatus rothi

Explanation of Figures 1 to 5

Figures 1 to 2: *Donax (Chion) punctatostriatus* Hanley. Figure 1: lectotype (herein) of *D. punctatostriatus* Hanley, length 35.5 mm. Figure 2: lectotype (herein) of *D. sowerbyi* Bertin, length 23.6 mm. Figure 3: *D. (Chion) caelatus caelatus* Carpenter, lectotype (herein), length 35.0 mm.
 Figures 4 to 5: *D. (Chion) caelatus rothi* Coan, new subspecies. Figure 4: holotype, length 21.5 mm. Figure 5: a paratype, length 19.8 mm

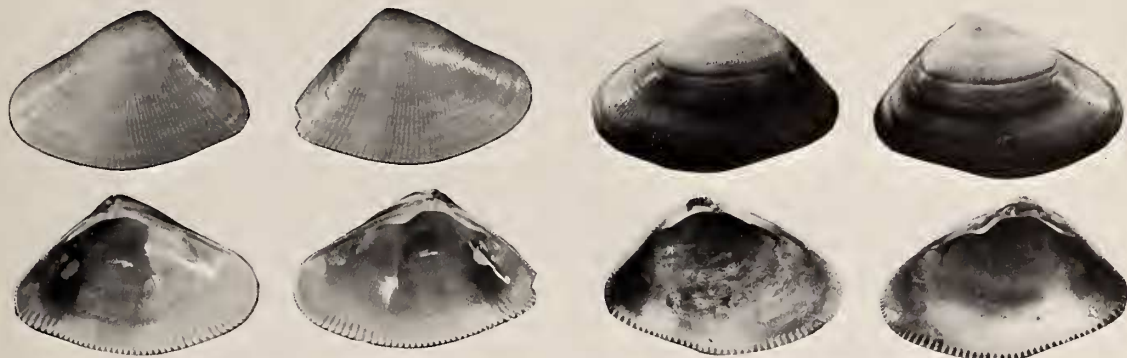


Figure 1

Figure 2



Figure 3



Figure 4

Figure 5

- (8a) Shell with a sharp carina or ridge setting
off posterior slope. 9
- (8b) No such carina or ridge present. 10
- (9a) Shell very elongate ($1/h = 2.3$). *D. transversus*
- (9b) Shell not so elongate ($1/h = 1.7$). *D. carinatus*
- (10a) Shell elongate ($1/h = 1.9-2.6$). 11
- (10b) Shell not elongate ($1/h = 1.3-1.7$). 13
- (11a) Both lateral hinge teeth evident; well separated,
equidistant from cardinals. 12
- (11b) Posterior lateral tooth scarcely evident; anterior
lateral very close to cardinals. *D. kindermannii*
- (12a) Ventral edge flexed; periostracum smooth but
not shiny; shorter ($1/h = 1.9$). *D. californicus*
- (12b) Ventral edge not flexed; periostracum very
shiny; longer ($1/h = 2.3$). *D. gracilis*
- (13a) Shell high ($1/h = 1.3$). 14
- (13b) Shell elongate ($1/h = 1.5-1.7$). 15
- (14a) Shell thin; sculpture fine; laterals thin,
elongate, laterally directed. *D. dentifer*
- (14b) Shell thick; sculpture heavy; laterals thick,
short, more ventrally directed. *D. asper*
- (15a) Shell relatively smooth. 16
- (15b) Shell with conspicuous radial sculpture. *D. assimilis*
- (16a) Shell elongate ($1/h = 1.7$); flat ($th/h = 0.60$).
D. marincovichii
- (16b) Shell shorter ($1/h = 1.5$); inflated ($th/h =$
 $0.72-0.74$). 17
- (17a) Cardinal teeth of left valve of equal size;
anterior lateral more distant, elongate;
California and Baja California. *D. gouldii*
- (17b) Posterior cardinal of left valve smaller;
laterals equidistant; South America. *D. obesulus*
(those lacking pits)

(*Chion*) Scopoli, 1777

[Type species: *Donax denticulatus* Linnaeus, 1758; by M]

Relatively thick-shelled; interspaces between radial ribs with punctations or concentric striations. The valves close tightly; periostracum not very adherent. The pallial sinus reaches anteriorly past the beaks.

The left valve has a large anterior cardinal, a small posterior cardinal, and a conspicuous lateral on each side. The right valve has a large posterior cardinal and a small, thin anterior cardinal; there are large grooves for the laterals of the left valve, and the ventral edges of these grooves (here called "submarginal ridges") are often swollen into lateral teeth.

Most eastern Pacific species belong to this subgenus, the type species of which is from the Caribbean. The habitat,

behavior, and anatomy of *D. denticulatus* have been discussed by WADE (1967a, 1969) and by TRUEMAN (1971).

Donax (Chion) punctatostratus Hanley, 1843

(Figures 1, 2)

Donax punctatostratus Hanley, 1843

HANLEY, 1843a-1844: 84-85; 9 (plt. expl.); plt. 14, fig. 24 [as *D. "punctato-striata"*]

HANLEY, 1843b: 5

REEVE, 1854: plt. 3, figs. 16a, b

CARPENTER, 1857b: 232, 241, 246, 285, 304

CARPENTER, 1857c: 44-46, 548

CARPENTER, 1864b: 537, 541, 665 [1872: 23, 27, 151]

SOWERBY, 1866: 210; plt. 2 [= 281], figs. 49, 50

TRYON, 1869: 113 [as = *D. radiatus* Valenciennes]

RÖMER, 1870: 57-59; 119 (plt. expl.); plt. 10, figs. 4-10

BERTIN, 1881: 95

HERTLEIN & STRONG, 1949: 255-256; 258 (plt. expl.); plt. 1, fig. 17

KEEN, 1958: 186, 187; fig. 455

OLSSON, 1961: 341-342; 534 (plt. expl.); plt. 61, fig. 6 [Olsson's figs. 6a & 6b are of *D. caelatus*]

KEEN, 1971: 239, 241; fig. 598

Donax punctostratus, punctatoradiatus, punctatostratis, auctt., spelling errors

Donax sowerbyi Bertin, 1881

BERTIN, 1881: 85; plt. 4, figs. 2a-c

KEEN, 1958: 184 [as = *D. assimilis*]

KEEN, 1971: 237 [as = *D. panamensis*]

Type Material & Localities:

D. punctatostratus—BM(NH) 1912.6.18.27, lectotype herein, pair; length, 35.5 mm; height, 23.0 mm; thickness, 13.9 mm (Figure 1).

"China" (Hanley, 1843a); not certain (HANLEY, 1843b); Mazatlán, Sinaloa, Mexico ($23^{\circ}12'N$; $106^{\circ}24'W$) (REEVE, 1854).

D. sowerbyi—MNHN, pair, lectotype herein; length, 23.6 mm; height, 15.5 mm; thickness, 10.8 mm (Figure 2).

A second specimen in the MNHN is a paralectotype. A specimen illustrated by SOWERBY (1866: 307-308; plt. 1, fig. 21) as *D. assimilis* and cited by BERTIN (1881) would also be a paralectotype; this figure appears to be of a *D. dentifer*. The MNHN specimens were from an unknown locality and were purchased from Sowerby, but it seems most appropriate to restrict the concept of the taxon to the material Bertin actually had in hand.

Description: Medium-sized for genus, to 48 mm in length CAS 024441; "Lower California," Mexico); rhomboidal to elongate-rhomboidal, length 1.5 times height (sd, ± 0.1); somewhat inflated, thickness 0.61 times height (sd, ± 0.03); anterior end longer, slightly produced; posterior end slightly truncate ventrally; posterior slope often set off by an angle (more rounded in some); beaks not conspicuously inflated; external ligament short; ventral end flexed a little anterior of midline.

Surface relatively smooth, with incised striae; striae with radial punctations, which are sometimes larger and more elongate toward ends of shell; traces of dark periostracum present at shell margins.

Left valve with lateral teeth close to cardinals, the posterior a little more distant. Right valve with sockets for laterals, their ventral margins (submarginal ridges) swollen into teeth.

White to tan externally, sometimes with radial rays (especially in material from the Pacific Coast of Baja California). Internally purplish, often darker toward posterior end.

Distribution & Habitat: Isla Cedros (about 28°3' N; 115° 11' W) (USNM 13660; ANSP 52963); Laguna San Ignacio (26°45' N; 113°15' W) (USNM 105618), Baja California Sur, throughout the Gulf of California, to Manzanillo, Colima (19°3' N; 104°20' W) (CAS 024813), Mexico; intertidal area to about 5 m.

Records from farther north, including California (DALL, 1916, 1921), are not confirmed by any material in museum collections. I doubt that the species is established north of Laguna San Ignacio; the more northerly records probably represent stray settlings.

Records from farther south in Mexico and from Central America are based on *Donax caelatus*. Records from South America are based either on *D. obesulus* or on *D. caelatus rothi*.

I have seen 189 lots.

Donax (Chion) caelatus caelatus Carpenter, 1857

(Figure 3)

Donax punctatostratus "var." *caelatus* Carpenter, 1857

CARPENTER, 1857b: 246 [*nomen nudum*]

CARPENTER, 1857c: 46-47, 548 [as a "var." of *D. punctatostratus*]

BERTIN, 1881: 101

KEEN, 1958: 621 [as = *D. punctatostratus*]

OLSSON, 1961: 342

PALMER, 1963: 312

KEEN, 1968: 399; 402 (plt. expl.); plt. 56, fig. 34 [as = *D. punctatostratus*]

KEEN, 1971: 239 [as = *D. punctatostratus*]

Donax punctatostratus, *auctt.*, non Hanley, 1843

OLSSON, 1961: 534 (plt. expl.); plt. 61, figs. 6a, b

Type Material & Locality:

D. punctatostratus caelatus—BM(NH) Mazatlán Coll. 1857.6.4.-168, a closed pair, lectotype herein; length, 35.0 mm; height, 22.8 mm; thickness, 15.2 mm (Figure 3).

Same lot, 2 paralectotypes; tablet 168*, 2 more paralectotypes. Mazatlán, Sinaloa, Mexico (23°12' N; 106°25' W); F. Reigen; 1848-1850.

Description: Medium-sized for genus, to 49 mm in length (CAS 024812; Manzanillo, Mexico), smaller towards Central America; elongate-rhomboidal, length 1.5 times height (sd, ±0.1); somewhat inflated, thickness 0.67 times height (sd, ±0.04); anterior end longer, more so than in *Donax punctatostratus*, slightly produced; posterior end somewhat truncate ventrally; angle setting off posterior slope sharper than in *D. punctatostratus*; beaks somewhat inflated; ventral edge flexed a little anterior to beaks, less so than in *D. punctatostratus*.

Surface relatively smooth, ribs more raised than in *D. punctatostratus*; ribs becoming obsolete toward anterior end, narrower with wider interspaces posteriorly; interspaces (radial striae) punctate; punctations larger toward anterior end, replaced by fine concentric lineations on posterior slope. Traces of periostracum sometimes present at shell margin.

Hinge as in *D. punctatostratus*.

More brightly colored externally than *D. punctatostratus*, with a range of color—from dark tan through purple to red—often in radial bands; internally dark purple.

Distribution & Habitat: In the Gulf of California from Bahía de las Ánimas, Baja California North (28°50' N; 113°20' W) (LACM 67745), and Guaymas, Sonora (27°55' N; 110°54' W) (LACM 20147), Mexico, to Golfito, Costa Rica (8°37' N; 83°10' W) (ANSP 198973); intertidal area to 3 m; sand.

Explanation of Figures 6 to 11

Figures 6 to 9: *Donax (Chion) obesulus* Reeve. Figure 6: lectotype (herein) of *D. obesulus* Reeve, length 20.3 mm. Figure 7: holotype of *D. peruvianus* Deshayes, length 32.0 mm. Figure 8: lectotype (herein) of *D. radiatus* Valenciennes, length 30.0 mm. Figure 9: holotype of *D. mancorensis* Olsson, length 25.3 mm

Figure 10: *Donax (Chion) ecuadorianus* Olsson, holotype, length 18.6 mm

Figure 11: *D. (Chion) obesulus* Orbigny, holotype, length 11.3 mm

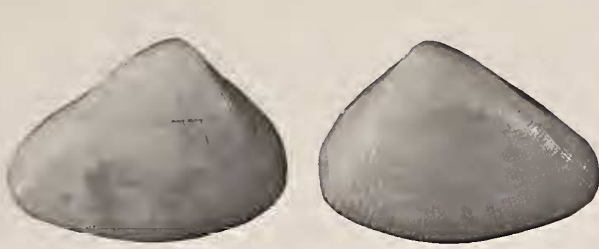


Figure 6



Figure 7



Figure 8

Figure 9



Figure 10

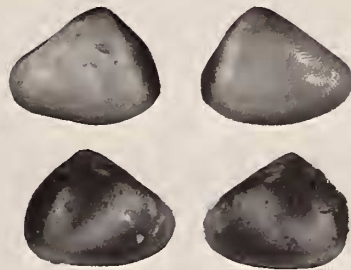


Figure 11

Specimens from the southern end of the distribution are much smaller in size than those from central Mexico.

I have seen 90 lots.

Discussion: Of the various eastern Pacific species in the subgenus *Chion*, this one is closest to the Caribbean type species, *Donax (C.) denticulatus* Linnaeus, 1758, from which it may be separated by its finer ribs, less angulate posterior slope, more prominent beaks, and the lack of the oblique sculpture characteristic of the postero-dorsal slope of *D. (C.) denticulatus* (though some oblique lines are present in specimens of *D. caelatus* from Costa Rica).

Donax (Chion) caelatus rothi Coan, new subspecies

(Figures 4, 5)

Type Material & Locality:

ANSP 353596, holotype, pair; length, 21.5 mm; height, 13.1 mm; thickness 10.0 mm (Figure 4).

ANSP 353597, 6 paratypes (Figure 5, a paratype).

[Punta] Malpelo, Tumbes Prov., Peru (about 3°30' S; 80°31' W); H. A. Pilsbry.

Description & Differential Diagnosis: Small for genus, to 22 mm in length (USNM 517695; Ecuador); more ovate than *D. c. caelatus*, length 1.5 times height (sd, ± 0.1); inflated, more so than *D. c. caelatus*, thickness 0.74 times height (sd, ± 0.02); anterior end longer, slightly produced (less so than *D. c. caelatus*); posterior end rounded, less truncate than *D. c. caelatus*; ventral edge more rounded, without the flexure of the nominal subspecies; angle setting off posterior slope less evident.

Surface similar to that of the nominal subspecies, but sculpture more subdued, becoming almost obsolete toward central slope and near ventral margin. Periostracum as in nominal subspecies.

Hinge and color pattern as in the nominal subspecies.

Distribution & Habitat: Canoa, Manabi Prov., Ecuador (0°27' S; 80°44' W) (CAS 024805), to Punta Sal, Talara, Piura Prov., Peru (about 4°34' S; 81°17' W) (LACM 64544); intertidal area to 3 m; no bottom types have been recorded. Presumably the subspecies occurs chiefly in the intertidal zone on open sandy beaches.

There is a single valve in the USNM supposedly from Salaverry, La Libertad Prov., Peru (USNM 792352), but it was encountered among a set of large, numbered valves of *Donax obesulus*, and I strongly suspect that this one valve has been mixed into the lot in recent years. Other than this questionable specimen, I have seen 16 lots.

Discussion: This subspecies was present among material referred by Olsson to *Donax mancorensis*, and it also accounts for some of the South American records of *D. punctatostriatus* (as CAUQUOIN, 1969: 582-583). It may be distinguished from punctate specimens of *D. obesulus*, with which it occurs throughout its distribution, by its radially deployed punctations and its fine concentric lineations between the radial ribs on the dorsal part of the posterior slope.

This subspecies is separated from the most southerly known occurrence of the nominate species by some 800 miles. It is named for Dr. Barry Roth of the California Academy of Sciences.

Referred Material:

CAS 024805—Canoa, Manabi Prov., Ecuador

CAS 024810—Manta, Manabi Prov., Ecuador

USNM 517695—between Manta and Manglaralto, Guayas Prov., Ecuador

CAS 024811—Manglaralto, Guayas Prov., Ecuador

MNHN—Santa Elena Peninsula, Guayas Prov., Ecuador

LACM 71-188—Punto Carnero, Guayas Prov., Ecuador

LACM 70-13—Playas, Guayas Prov., Ecuador

MCZ 233628—same locality

Coll. of Carol Skoglund of Phoenix, Arizona—same locality

ANSP 353596 & 353597—Punta Malpelo, Tumbes Prov., Peru—Type Lot

LACM 72-80—Caleta La Cruz, Tumbes Prov., Peru

ANSP 353534—same locality

ANSP 353435—same locality

ANSP 353431—Mancora, Piura Prov., Peru

CAS 024806—Punta Oreganos "Chica," Piura Prov., Peru

LACM 64544—Punta Sal, Talara, Piura Prov., Peru

Donax (Chion) obesulus Reeve, 1854

(Figures 6, 7, 8, 9)

Donax obesulus Reeve, 1854, ex Deshayes MS

REEVE, 1854; pl. 5, fig. 30 [as "*obesula* Deshayes"]

DESHAYES, 1855: 352 [as "*obesula*"]

SOWERBY, 1866: 308; pl. 1 [= 280], fig. 15

BERTIN, 1881: 101

DALL, 1909: 273

SMITH, 1944: 63, fig. 825

HERTLEIN & STRONG, 1949: 255

KEEN, 1958: 186, 187; fig. 452

OLSSON, 1961: 339 [as = *D. rostratus*]

KEEN, 1971: 237, 238; fig. 594 [lower figure only]

Donax peruvianus Deshayes, 1855

DESHAYES, 1855: 350-351 [as "*peruviana*"]

RÖMER, 1870: 55-56 [in part; the figures—pl. 9, figs. 18-20—seem to depict specimens of *D. marincovichii*]

BERTIN, 1881: 104

OLSSON, 1961: 343; 533 (plt. expl.); pl. 60, figs. 2-2c

KEEN, 1971: 238, 239; fig. 597

- Donax radiatus* Valenciennes, 1827
 VALENCIENNES, 1827: 221-222; 224 (plt. expl.); plt. 50, figs. 3a-c, 4 [as "*radiata*"]
 ORBIGNY, 1845: 541
 RÖMER, 1870: 58-59 [as a variety of *D. punctatostriatus*]
 BERTIN, 1881: 95-96; plt. 3, figs. 1a, b
 [non *D. radiatus* GMELIN, 1791: 3266—as *D. "radiata"*; an Asian taxon]
Donax aricanus Dall, 1909, replacement name for *D. radiatus* Valenciennes, non Gmelin
 DALL, 1909: 272 [as *D. "aricana"*]
Donax mancorensis Olsson, 1961
 OLSSON, 1961: 340; 534 (plt. expl.); plt. 61, figs. 3-3b
 KEEN, 1971: 235, 237; fig. 592
Donax punctatostriatus Hanley, auctt., non Hanley, 1843

Type Material & Localities:

- D. obesulus*—BM(NH) 198218, lectotype herein, pair; length, 20.3 mm; height, 14.4 mm; thickness, 10.1 mm (Figure 6). There are 3 probable paralectotypes in BM(NH) 198219. Peru (REEVE, 1854). The sculpture is such that one may assume the specimen came from the northern coast of Peru, probably from the Gulf of Guayaquil, Tumbes Prov. (about 3°30' S; 80°30' W).
D. peruvianus—BM(NH) 1966.544, holotype, right valve; length, 32.0 mm; height, 20.0 mm; thickness, 6.8 mm (Figure 7). Peru (DESHAYES, 1855); "graves [?] Indian kitchen middens] in Peru; I. Fryer" (label).
D. radiatus Valenciennes (and *D. aricanus*)—MNHN, the larger of two pairs, lectotype herein; length, 30.0 mm; height, 18.5 mm; thickness, 14.6 mm (Figure 8). The second pair, a paralectotype, measures 29.2 mm in length, 18.4 mm in height, and 12.5 mm in thickness. "Warm shores of the Pacific Coast of America." The specimens were probably obtained by Alexander von Humboldt and A. J. A. Bonpland in the area of Callao, Lima Prov., Peru, in November 1802 (12°03' S; 77°10' W) (concerning Humboldt's travels, see DE TERRA, 1955).
D. mancorensis—ANSP 218910, holotype, pair; length, 25.3 mm; height, 17.9 mm; thickness, 13.2 mm (Figure 9). Zorritos, Tumbes Prov., Peru (3°40' S; 80°40' W).

Description: Medium-sized for genus, to 38 mm in length (USNM 517694; Ecuador, between Manta and Manglaralto); elongate-rhomboidal, length 1.5 times height (sd, ± 0.1); inflated, thickness 0.74 times height (sd, ± 0.03); anterior end longer, produced; posterior end somewhat

produced, rounded; posterior slope only slightly set off by an angle; beaks inflated; ligament short; ventral margin rounded, with only a slight flexure a little anterior to beaks.

Surface smooth, shiny; radial striae present but not very incised, fading out toward anterior slope, more crowded toward posterior slope; in most, with a few irregularly scattered punctations along radial striae on younger portion of shell in a radial zone near anterior end. (Occasional specimens lack punctations.) In specimens from the Gulf of Guayaquil area, the punctations are much more prevalent, forming a pattern that dips toward the ventral margin at anterior end, as in the type specimens of *D. obesulus* and *Donax mancorensis*. Periostracum evident only at shell margin.

Left valve with laterals close to cardinals, the anterior a little more distant; dorsal margin deflected above posterior lateral. Right valve with grooves for laterals of left valve, the submarginal ridges swollen into teeth.

White to tan externally, often with darker radial rays; internally flushed with purple, especially at umbones.

Distribution & Habitat: Canoa, Manabi Prov., Ecuador (0°27' S; 80°7' W) (CAS 024814), to La Rinconada, northwest end of Bahía Moreno, Antofagasta Prov., Chile (23°28' S; 70°31' W) (LACM 75-16). The only habitat recorded on labels is flat, sand beaches. I have seen 42 lots.

Discussion: It is unfortunate that the type specimen of *Donax obesulus* had not recently been studied, for it is virtually identical to the holotype of *D. mancorensis*, and both probably came from the Gulf of Guayaquil area—between Playas, Guayas Prov., Ecuador, and Talara, Piura Prov., Peru. It might be possible to restrict the name *D. obesulus* to populations in this area and to save the name *D. peruvianus* at the subspecific level, but two factors militate against this: first, material from still further north lacks the *D. obesulus*—pattern of punctations (as USNM 517694); secondly, some specimens from considerably further south have this punctate pattern (as USNM 368497, from Salaverry, La Libertad Prov., Peru). The punctate form may represent an ecological variant in calmer, warmer

Explanation of Figures 12 to 16

Figures 12 to 16: *Donax (Chion) culter* Hanley. Figure 12: lectotype (herein) of *D. culter*, length 33.7 mm. Figure 13: lectotype (herein) of *D. contusus* Reeve, length 33.4 mm. Figure 14: lectotype (herein) of *D. conradi* Reeve, length 38.1 mm. Figure 15: lectotype (herein) of *D. bitinctus* Reeve, length 27.8 mm. Figure 16: two specimens from Petatlán, Guerrero, Mexico; CAS 024815, lengths 34.3 & 35.5 mm



Figure 12



Figure 13



Figure 14



Figure 15



Figure 16

water. This sculptural pattern also suggests a phylogenetic relationship to *D. ecuadorianus*, which has the same ventrally dipping punctations (along with other features that make it unique).

The name *Donax obesulus* has been misapplied to *D. obesus* by RÖMER (1870) (see under the latter).

Donax (Chion) ecuadorianus Olsson, 1961

(Figure 10)

Donax ecuadorianus Olsson, 1961

OLSSON, 1961: 340-341; 534 (plt. expl.); plt. 61, figs. 2-2b

KEEN, 1971: 235, 236-237; fig. 589

Type Material & Locality:

ANSP 218909, holotype, pair; length, 18.6 mm; height, 13.0 mm; thickness, 9.0 mm (Figure 10).

Canoa, Bahía de Caráquez, Manabi Prov., Ecuador (0°27' N; 80°27' W).

Description: Medium-sized for genus, to 22 mm in length (USNM 792347; Ecuador, between Manta and Manglaralto); rhomboidal-elongate, length 1.4 times height (sd, ± 0.1); inflated, thickness 0.73 times height (sd, ± 0.03); anterior end longer, produced, almost pointed; posterior slope set off by an angle, somewhat truncate ventrally; beaks produced; external ligament short; ventral edge flexed a little anterior to beaks.

Surface with heavy radial ribs that become lower toward anterior slope and closer together on posterior slope; concentric ribs also present, on posterior slope almost equal in strength to radial ribs, forming nodes on the latter; ventral to beaks concentric ribs appearing as lineations between radial ribs as well as roughening the latter; toward anterior end concentric ribs wider, forming broad bands that override radial rays and dip ventrally; pits present at intersections of radial and concentric sculpture on anterior slope.

Hinge as in *Donax punctatostratus*.

White to tan externally, often with a bluish flush on beaks, sometimes with darker concentric bands; internally purple, but sometimes white.

Distribution & Habitat: Playa el Tamarindo, near Punta Ampala, Gulf of Fonseca, El Salvador (about 13°09' N; 87°52' W) (CAS 024445), to between Manta, Manabi Prov., and Manglaralto, Guayas Prov., Ecuador (about 1°30' S; 80°50' W) (USNM 792347); intertidal area to 1 m; sand. I have seen 21 lots.

This species may occur further northwest in El Salvador. The specimens reported by ZILCH (1954: 86) and SCHUSTER-DIETERICH (1956: 31) from El Salvador as "*D. gouldii*"

seem instead to be juveniles of this species. They came from Amate Campo (13°25' N; 89°10' W) (Senckenberg Mus. 254447) and La Pita (13°13' N; 88°50' W) (Senckenberg Mus. 254448). It would be best to await adult material to verify that the species is established at these stations.

Donax (Chion) obesus Orbigny, 1845

(Figure 11)

Donax obesus Orbigny, 1845

ORBIGNY, 1845: 541; plt. 81, figs. 28-30

REEVE, 1854: plt. 7, fig. 49

SOWERBY, 1866: 210; plt. 2 [= 281]; figs. 42, 43

TRYON, 1869: 109

RÖMER, 1870: 71-72; 120 (plt. expl.); plt. 12, figs. 11-13

BERTIN, 1881: 96-97

DALL, 1909: 273

HERTLEIN & STRONG, 1949: 254-255; 258 (plt. expl.); plt. 1, fig. 7

KEEN, 1958: 186, 187; fig. 453

OLSSON, 1961: 344-345; 534, 558 (plt. expl.); plt. 61, fig. 5; plt. 85, fig. 3

KEEN, 1966c: 7

KEEN, 1971: 237, 238; fig. 595

Donax obesulus Reeve, *auctt.*, non Reeve, 1854

RÖMER, 1870: 72-73; 120 (plt. expl.); plt. 12, figs. 14-16

Type Material & Locality:

BM(NH) 1854.12.4.702, holotype, pair; length, 11.3 mm; height, 9.2 mm; thickness, 7.9 mm (Figure 11).

Paita, Piura Prov., Peru (5°5' S; 81°7' W); M. Fontaine.

Description: Small for genus, to 15.2 mm in length (LACM 64547; Barranco, Costa Rica); ovate, length 1.3 times height (sd, ± 0.05); inflated, thickness 0.72 times height (sd, ± 0.03); anterior end longer; posterior end rounded, with only a hint of ventral truncation; posterior slope set off by a very rounded angle.

Surface with flat radial ribs on anterior end and central slope, with narrow, pitted, incised striae between them; radial ribs obsolete on ends of shell, narrower and denser on posterior slope. Periostracum not evident.

Hinge as in *Donax punctatostratus*.

Externally white, tan, brown, or olive; internally bluish-purple.

Distribution & Habitat: ? Zihuatanejo, Guerrero, Mexico (17°38' N; 101°34' W) (AMNH 198975), but according to Dr. William K. Emerson (*in litt.*, 16 Oct. 1981), there is some chance of mixing in the AMNH's Beebe set of materials from the Templeton-Crocker expedition, so this record must be reconfirmed. Playa el Tamarindo, near Punta Ampala, Gulf of Fonseca, El Salvador (about 13° 9' N; 87°52' W) (CAS 024444), to Canoa, Manabi Prov.,

Ecuador (0°27' S; 80°7' W) (CAS 025753). PEÑA (1971) has reported this species from Puerto Pizarro, Tumbes Prov., Peru (3°30' S; 80°25' W), but I have not seen his material and this is a species that might easily be confused with *D. obesulus* or with *D. caelatus rothi*. It may occur as far south as the type locality of Paita, Piura Prov., Peru (5°5' S; 81°7' W), but there are no other records of this uncommon species from that far south. I have seen only 12 lots.

Donax (Chion) culter Hanley, 1845

(Figures 12, 13, 14, 15, 16)

Donax culter Hanley, 1845

- HANLEY, 1845a: 14
 REEVE, 1854: plt. 4, fig. 21
 CARPENTER, 1857c: 47-49 [as = *D. conradi*]
 SOWERBY, 1866: 310; plt. 2 [= 281]; figs. 56, 57 [as "var." of *D. californicus*, auctt.]
 TRYON, 1869: 112
 RÖMER, 1870: 59-61; 119 (plt. expl.); plt. 10, figs. 11-16
 BERTIN, 1881: 92-93
 KEEN, 1958: 185; fig. 448
 OLSSON, 1961: 345-346; 532 (plt. expl.); plt. 59, figs. 5-5b
 KEEN, 1971: 235, 236; fig. 587

Donax contusus Reeve, 1854

- REEVE, 1854: plt. 4, fig. 24 [as *D. "contusa"*]
 CARPENTER, 1857c: 47-49 [as = *D. conradi*]
 SOWERBY, 1866: 210; plt. 2 [= 281]; figs. 53, 55
 TRYON, 1869: 112
 RÖMER, 1870: 59-61 [as = *D. culter*]
 BERTIN, 1881: 92
 TOMLIN, 1926: 52-53
 HERTLEIN & STRONG, 1949: 258 (plt. expl.); plt. 1, fig. 14
 KEEN, 1958: 184-185; fig. 447
 KEEN, 1971: 235, 236; fig. 586

Donax conradi Reeve, 1854, ex Deshayes MS

- REEVE, 1854: plt. 5, fig. 29 [as "Deshayes"]
 DESHAYES, 1855: 351
 CARPENTER, 1857c: 47-49
 SOWERBY, 1866: 310; plt. 2 [= 281], fig. 51
 RÖMER, 1870: 59-61 [as = *D. culter*]
 BERTIN, 1881: 91-92
 TOMLIN, 1926: 52-53 [as = *D. contusus*]
 KEEN, 1958: 184 [as = *D. contusus*]
 OLSSON, 1961: 534 (plt. expl.); plt. 61, figs. 4-4b [not in text]
 KEEN, 1971: 236 [as = *D. contusus*]

Donax bitinctus Reeve, 1855

- REEVE, 1855: plt. 9, fig. 68 [as *D. "bitincta"*]
 TRYON, 1869: 112 [as = *D. contusus*]
 RÖMER, 1870: 38
 TOMLIN, 1926: 53 [as = *D. contusus*]
 KEEN, 1958: 184 [as = *D. contusus*]
 KEEN, 1971: 236 [as = *D. contusus*]

Donax californicus, auctt., non Conrad, 1837

- REEVE, 1854: plt. 6, fig. 40
 SOWERBY, 1866: 310; plt. 2 [= 281], fig. 54
 [non CONRAD, 1837: 254; plt. 19, fig. 21]

Type Material & Localities:

- D. culter*—BM(NH) 1966.547, lectotype herein, the specimen figured by Reeve, pair; length, 33.7 mm; height, 14.2 mm; thickness, 9.0 mm (Figure 12).
 There are two paralectotypes. Mazatlán, Sinaloa, Mexico (about 23°12' N; 106°25' W); H. Cuming.
D. contusus—BM(NH) 198216, lectotype herein, the specimen figured by Reeve, pair; length, 33.4 mm; height, 16.5 mm; thickness, 9.6 mm (Figure 13).
 There are no additional specimens in this BM(NH) lot. Mazatlán, Sinaloa, Mexico (about 23°12' N; 106°25' W).
D. conradi—BM(NH) 198217 lectotype herein, the specimen figured by Reeve, pair; length, 38.1 mm; height, 21.7 mm; thickness, 13.0 mm (Figure 14).
 There are two paralectotypes. Gulf of California, Mexico.
D. bitinctus—BM(NH) 1900.3.19.1, lectotype herein, the specimen figured by Reeve, pair; length, 27.8 mm; height, 15.4 mm; thickness, 9.4 mm (Figure 15).
 There are 2 paralectotypes. Locality unknown (REEVE, 1854).

Description: Medium-sized for genus, to 47 mm (CAS 024815; Bahía Petatlán, Guerrero, Mexico); elongate-ovate, length 2.0 times height (sd, ± 0.2); flatter than other species of *Chion*, thickness only 0.59 times height (sd, ± 0.03); anterior end longer, slightly produced; posterior end pointed, very slightly truncate ventrally; posterior end only a little set off by an angle; beaks not conspicuously inflated; ligament elongate; ventral edge only slightly flexed a little anterior to beaks, much less so than in *Donax punctatostriatus* or *D. caelatus*. Posterior end longer, broader in young specimens and in adults from the southern end of the species' distribution.

Surface relatively smooth, not unlike that in *Donax punctatostriatus*, with incised striae; striae closer together on posterior end, becoming obsolete on anterior end; striae with radial punctations, which are larger towards ends of shell. The deployment of the striae and their punctations differs among specimens to a greater degree than in either *D. punctatostriatus* or *D. caelatus*, with punctations missing on the central slope of some specimens and even the striae missing in this area on others.

Hinge as in other species of *Chion*, except that the posterior lateral of the left valve, the pocket for it in the right valve, and the tooth on the submarginal ridge of the right valve are more distant from cardinals. Additionally, the anterior laterals are closer to the cardinals than in other species, this feature especially pronounced in material from the southern end of the species' distribution.

White to tan externally, often with concentric bluish bands, a characteristic feature; internally purple.

Distribution & Habitat: Mexico from Isla San Ignacio, Sonora (25°25' N; 108°55' W) (LACM 109054; AMNH 180-442), and La Paz, Baja California Sur (24°10' N; 110°19' W) (USNM 34072), to Acapulco, Guerrero (16°51' N; 99°56' W)

(many lots, including USNM 109348; LACM 64506; CAS 024809). Intertidal area to 2m; sand. I have seen 91 lots.

RANSON (1959: 74) reported *Donax conradi* from the Pleistocene north of Chimbote, Peru. I suspect that this record was based on *D. obesulus*. Records of *D. conradi* from California (DALL, 1916, 1921) are not confirmed by specimens in any collection examined.

Discussion: This is, beyond question, the most variable species of Eastern Pacific *Donax* in terms of proportions and especially outline. Of it, CARPENTER (1857c: 47) said, "It is not without the most careful, laborious and often repeated examination of upwards of 1,000 specimens that I have felt compelled to depart from the views of the illustrious Deshayes and the very accurate Hanley, and group together the species above quoted [*D. conradi*, *D. contusus*, *D. californicus* of authors, and *D. culter*]. . . . This creature loves liberty both in form and color. . . . The lines of growth shew that the adult by no means thinks it necessary to preserve the form of early life." Unfortunately, Carpenter chose one of the later-proposed names for the species because he felt that its type specimens better expressed the adult form.

Specimens from the southern end of the distribution of this species tend to have more inflated, more truncate posterior ends than material from farther north. Northern material is not unlike the type specimens of *Donax culter*. Southern specimens, on the other hand, can be very truncate posteriorly (Figure 16) and sometimes approach the shape of *D. (Amphichaena) kindermanni*, with which it occurs. It may be distinguished from this species by its more sculptured, punctate shells, its shorter posterior end, its somewhat more distant anterior lateral tooth, and its more prominent posterior lateral tooth, these hinge features most easily seen in right valves (see table under *D. kindermanni*). Some southern specimens, while having a shape characteristic of *D. culter* in those latitudes, have concentric sculpture between the radial ribs on the posterior slope that approaches the pattern of *D. (Chion) caelatus*. Future workers may want to give southern specimens a subspecific name, all of the synonyms evidently being based on northern specimens.

The clinal change in this species and the unusual southern material are both topics that are worth further investigation. It is not impossible that one explanation may lie in former or present hybridization among *Donax caelatus*, *D. culter*, and/or *D. kindermanni* in the Acapulco area.

WEISBORD (1964) suggested that this species is similar to a new species he described from the Caribbean, *Donax higuerotensis* (pp. 366-368, 542; pl. 53, figs. 1-9). However, his new taxon proved to be a synonym of *D. vellicatus* Reeve, 1855 (MORRISON, 1971: 564), which is not closely related to *D. culter*.

Group of *Donax assimilis*

This group of West American species is characterized by having large, high to quadrate shells, the right valve overlapping the left valve at the postero-ventral margin. The shells are thick to thin, and they lack a gape and surface punctations.

Left valve with two cardinals, the posterior often smaller; anterior and posterior laterals present. Right valve with two cardinals, the anterior the smaller; anterior and posterior laterals on sub-marginal ridges.

Donax assimilis Hanley, 1845

(Figures 17, 18, 19)

Donax assimilis Hanley, 1845

HANLEY, 1845b: 17

C. B. ADAMS, 1852a: 501 [1852b: 277]

REEVE, 1854: pl. 2, fig. 10

CARPENTER, 1857b: 186, 236, 245, 279, 297, 304

CARPENTER, 1857c: 44

MÖRCH, 1860: 192

CARPENTER, 1864a: 366 [1872: 202]

CARPENTER, 1864b: 537 [1872: 23]

SOWERBY, 1866: 307-308; pl. 1 [= 280], fig. 21

TRYON, 1869: 107

RÖMER, 1869b-1870: 20-21; 119 (pl. expl.); pl. 4, figs. 13-17

BERTIN, 1881: 85

HERTLEIN & STRONG, 1949: 252

KEEN, 1958: 184, 185; fig. 444

OLSSON, 1961: 339 [as possibly = *D. dentifer*]

KEEN, 1971: 236 [as = *D. dentifer*]

Donax panamensis Philippi, 1848

PHILIPPI, 1848: 145

REEVE, 1855: pl. 9, fig. 63

CARPENTER, 1857b: 295, 304

TRYON, 1869: 113

KEEN, 1958: 184 [as = *D. assimilis*]

OLSSON, 1961: 339-340; 532 (pl. expl.); pl. 59, figs. 3, 3a

KEEN, 1971: 237, 238; fig. 596

Donax "cayennensis Lamarck," auctt., non *D. caianensis* Lamarck, 1818

REEVE, 1854: pl. 4, figs. 23a, b

SOWERBY, 1866: 308; pl. 2 [= 281], figs. 46-48

MARTINEZ Y SAEZ, 1870: 17-18; pl. 4, figs. 6-8

[non *Donax caianensis* LAMARCK, 1818: 550]

Donax curtus Sowerby, 1866

SOWERBY, 1866: 308; pl. 1 [= 280], fig. 20

TRYON, 1869: 108

BERTIN, 1881: 85

OLSSON, 1961: 338 [as = *D. rostratus*]

KEEN, 1971: 237 [as = *D. obesulus*]

Donax reevei Bertin, 1881

BERTIN, 1881: 85

KEEN, 1958: 184 [as = *D. assimilis*]

KEEN, 1971: 237 [as = *D. panamensis*]

Type Material & Localities:

D. assimilis—BM(NH) 198214, lectotype herein, the specimen figured by Reeve, pair; length, 41.2mm; height, 28.8mm; thickness, 17.9mm (Figure 17).

There are 2 paralectotypes. [West coast of] Panama.

D. panamensis—BM(NH) 1952.10.30.93, lectotype herein, the specimen figured by Reeve, pair; length, 28.2mm; height, 19.1mm; thickness, 11.5mm (Figure 18).

There were no additional syntypes in the BM(NH), or in either the Humboldt Museum (Kilian, *in litt.*, 27 Aug. 1980) or in the Museo Nacional de Historia Natural in Santiago, Chile (Bahamonde, *in litt.*, 16 April 1981). [West coast of] Panama; E. B. Philippi.

D. curtus—BM(NH) 1874.12.11.399, lectotype herein, the specimen figured by Sowerby; pair; length, 23.0mm; height, 17.4mm; thickness, 10.5mm (Figure 19).

BM(NH) 1879.2.26.224, probable paralectotype.

ANSP 51567, 2 possible paralectotypes.

"Caraccas Bay" [Bahía de Caráquez], Manabi Prov., "W. Columbia" [Ecuador] (0°35' S; 80°25' W).

D. reevei—BM(NH) 198214, holotype, the lectotype of *D. assimilis* (see above) (Figure 17).

[West coast of] Panama.

Description: Medium-sized for genus, to 44mm (AMNH 78389; Corinto, Nicaragua); ovate, length 1.5 times height (sd, ± 0.1); moderately inflated, thickness, 0.61 times height (sd, ± 0.03); anterior end longer, rounded; posterior end short, almost straight; posterior end set off by a rounded angle; beaks not especially inflated; ventral margin evenly arcuate.

Flat radial ribs present on central and anterior slopes, fading out at anterior end; ribs raised and more crowded on posterior slope; in some specimens with one or two larger radial ribs positioned about two-thirds of the way from the postero-dorsal margin to the angle setting off posterior slope, forming conspicuous interlocking "teeth" where they end at posterior margin (as in the lectotype of *D. assimilis*). Specimens with these larger ribs are not common, unlike in *D. dentifer* where they are nearly always present. Posterior slope also with concentric sculpture

forming a network pattern that fades out anteriorly about under beaks. Periostracum not evident.

Left valve with a large anterior cardinal and a smaller posterior cardinal; an elongate anterior lateral parallels dorsal margin; posterior lateral shorter, closer to cardinals. Right valve with a large posterior cardinal and a very small anterior cardinal; anterior submarginal ridge with a tooth that is parallel to dorsal margin; tooth also present on posterior submarginal ridge.

External color purple, white, or pink; internally with a purple suffusion.

Distribution & Habitat: ?Zihuatanejo, Guerrero, Mexico (17°38' N; 101°34' W) (AMNH 198874) (see cautionary note under *Donax obesus*); Playa el Tamarindo, near Punta Ampala, Gulf of Fonseca, El Salvador (about 13°9' N; 87°52' W) (CAS 024448), to Punta Española, Isla de Puná, Gulf of Guayaquil, Guayas Prov., Ecuador (2°48' S; 79°56' W) (ANSP 53032). The only data recorded on labels is intertidal sand. I have seen 126 lots.

Discussions: The *Donax assimilis* reported by PARKER (1964) from Mazatlán, Mexico, was instead a mixture of *D. punctostriatus* and *D. culter* (MCZ 254104). The *D. panamensis* [= *D. assimilis*] reported by DEXTER (1974) from La Punta, Costa Rica, was a mixture of *D. asper*, *D. dentifer*, and *D. ecuadorianus*; the *D. panamensis* from Sámara, Costa Rica, is *D. asper*; the *D. panamensis* from Playa Cocal, Costa Rica, is *D. caelatus*; the *D. panamensis* from Jacó and Playa Espadilla, Costa Rica, are *D. ecuadorianus* (all MCZ, no assigned numbers).

Donax dentifer Hanley, 1843

(Figures 20, 21)

Donax dentifer Hanley, 1843

HANLEY, 1843a-1844: 84; 9 (plt. expl.); plt. 14, fig. 20 [as *D. "dentifera"*]

Explanation of Figures 17 to 21

Figures 17 to 19: *Donax assimilis* Hanley. Figure 17: lectotype (herein) of *D. assimilis* Hanley and holotype of *D. reevei* Bertin, length 41.2 mm. Figure 18: lectotype (herein) of *D. panamensis* Philippi, length 28.2mm. Figure 19: lectotype (herein) of *D. curtus* Sowerby, length 23.0mm

Figures 20 to 21: *Donax dentifer* Hanley. Figure 20: lectotype (herein) of *D. dentifer*, length 32.0mm. Figure 21: lectotype (herein) of *D. paytensis* Orbigny, length 28.2mm



Figure 17

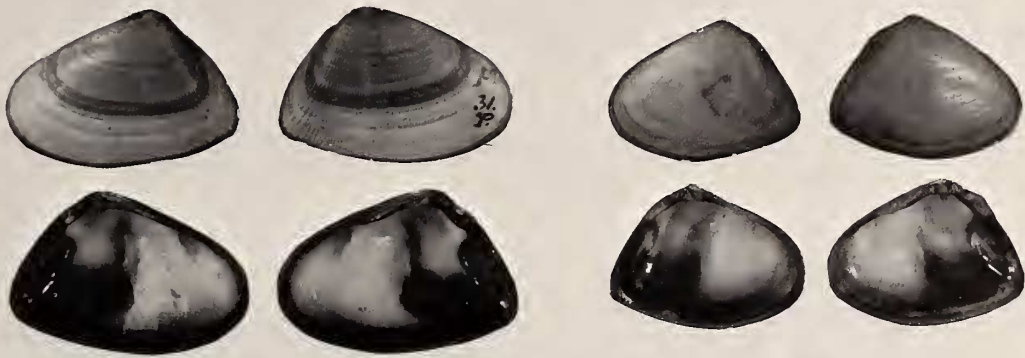


Figure 18

Figure 19

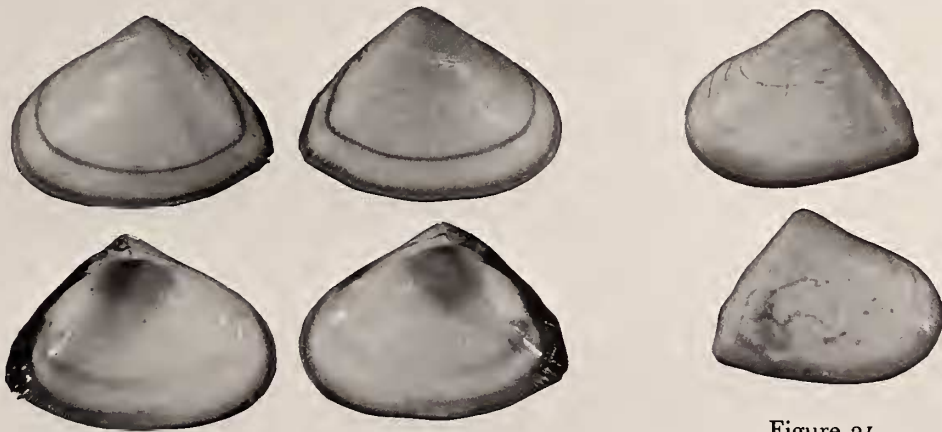


Figure 20

Figure 21

- HANLEY, 1843b: 6 [as *D. "dentifera"*]
 REEVE, 1854: plt. 1, figs. 2a, b [as *D. "dentifera"*]
 MÖRCH, 1860: 192
 SOWERBY, 1866: 307; plt. 1 [= 280], fig. 23 [as *D. "dentiferus"*]
 TRYON, 1869: 111 [as *D. "dentifera"*]
 RÖMER, 1869b-1870: 12-13; 119 (plt. expl.); plt. 3, figs. 11-15
 BERTIN, 1881: 80
 KEEN, 1958: 185; fig. 449
 OLSSON, 1961: 344; 532, 558 (plt. expl.); plt. 59, figs. 2-2b [as *D. "dentiferus"*] [his plt. 85, fig. 4, is *D. assimilis*, a paralectotype from the type lot of *D. paytensis*]
 KEEN, 1971: 235, 236; fig. 588
Donax paytensis Orbigny, 1845
 ORBIGNY, 1845: 541-542
 BERTIN, 1881: 103
 DALL, 1909: 273
 OLSSON, 1961: 344 [as = *D. dentifer*]
 KEEN, 1966c: 7 [as = *D. dentifer*]
 KEEN, 1971: 236 [as = *D. dentifer*]

Type Material & Localities:

D. dentifer—BM(NH) 1912.6.18.28, lectotype herein, presumably the pair figured by Hanley; length, 32.0 mm; height, 23.8 mm; thickness, 15.2 mm (Figure 20).

"South America" (HANLEY, 1843a).

D. paytensis—BM(NH) 1854.12.4.703, lectotype herein, the larger, higher specimen, a sealed pair; length, 28.2 mm; height, 21.4 mm; thickness, 13.4 mm (Figure 21).

There are 3 paralectotypes, one of which is a *D. assimilis* (length, 27.8 mm) and was figured by OLSSON (1961: plt. 85, fig. 4). A third specimen (16.7 mm long) is a young *D. dentifer*, and a fourth (21.5 mm), possibly added to the lot later, is a specimen of *D. obesulus* Reeve.

Paíta, Piura Prov., Peru (5°5' S; 81°7' W); M. Fontaine. This locality may be in error, as it is farther south than any modern record.

Description: Medium-sized for genus, to 48 mm (Skoglund Coll.; Playas, Ecuador); trigonal, length 1.3 times height (sd, ±0.1); valves moderately inflated, thickness 0.59 times height (sd, ±0.04); thin-shelled; anterior end longer, slightly produced, rounded; posterior end short, truncate ventrally; posterior end set off by a sharp angle; beaks inflated; ventral margin evenly curved.

Very fine, flat radial ribs present on central and anterior slopes, fading out at anterior end; ribs narrow toward posterior end, widely spaced at the sharp demarcation of central slope from the posterior end, close together on posterior slope; two-thirds of the way from posterior margin to demarcation of central slope one or two ribs much larger than others, projecting to form interlocking "teeth" at shell margin; concentric sculpture also present on posterior slope, forming a network pattern.

Left valve with a large anterior cardinal and a smaller posterior cardinal; anterior lateral close to cardinals, elongate, anteriorly directed; posterior lateral shorter,

more distant. Right valve with a large posterior cardinal and a very small anterior cardinal; anterior submarginal ridge with an elongate lateral tooth; posterior submarginal ridge with a shorter tooth. Pallial sinus short, not reaching past beaks.

Externally bluish, often with darker circular bands; internally purplish.

Distribution & Habitat: "Coast of Guatemala" (CAS 024-454) (thus at least as far north and west as 13°46' N; 90°10' W); Los Blancos, El Salvador (13°20' N; 89°00' W) (Senckenberg Mus. 254449, 254450); Playa el Tamarindo, near Punta Ampala, Gulf of Fonseca, El Salvador (about 13°9' N; 87°52' W) (CAS 024446), to Playas, Guayas Prov., Ecuador (2°39' S; 80°23' W) (CAS 025754); possibly as far south as Paíta, Piura Prov., Peru (5°5' S; 81°7' W), the type locality of *Donax paytensis*. The only habitat information recorded on labels is intertidal sand. I have seen 49 lots.

Donax asper Hanley, 1845

(Figures 22, 23)

Donax asper Hanley, 1845

HANLEY, 1845b: 14-15

REEVE, 1854: plt. 2, fig. 12

SOWERBY, 1866: 307; plt. 1 [= 280], fig. 24

TRYON, 1869: 111

RÖMER, 1869b-1870: 14-15; 119 (plt. expl.); plt. 3, figs. 7-10

BERTIN, 1881: 80-81

DALL, 1909: 159, 273; 294 (plt. expl.); plt. 28, fig. 7

SMITH, 1944: 63; fig. 818

HERTLEIN & STRONG, 1949: 251-252

HERTLEIN & STRONG, 1955: 202

KEEN, 1958: 184, 185; fig. 443

OLSSON, 1961: 343-344; 532 (plt. expl.); plt. 59, figs. 1-1d

KEEN, 1971: 235, 236; fig. 583

Donax granifer Reeve, 1854, ex Deshayes MS

REEVE, 1854: plt. 7, fig. 43 [as *D. "granifera* Deshayes"]

DESHAYES, 1855: 353

SOWERBY, 1866: 307; plt. 1 [= 280], fig. 18 [as *D. "graniferus"*]

RÖMER, 1870: 68-69; 120 (plt. expl.); plt. 12, figs. 5-7

BERTIN, 1881: 96 [as *D. "graniferus"*]

Donax rostratus C. B. Adams, *autct.*, non Adams, 1852

OLSSON, 1961: 338-339; 534 (plt. expl.); plt. 61, figs. 1-1b

Type Material & Localities:

D. asper—BM(NH) 198212, lectotype herein, the specimen figured by Reeve, pair; length, 42.6 mm; height, 32.5 mm; thickness, 21.0 mm (Figure 22).

There are 2 paralectotypes in this lot, and 3 probable paralectotypes in BM(NH) 198213.

Tumbez, Tumbez Prov., Peru (3°32' S; 80°25' W).

D. granifer—BM(NH), lectotype herein, the figured syntype, pair; length, 18.5 mm; height, 13.4 mm; thickness, 9.3 mm (Figure 23).

There are two paralectotypes.

Loc. unknown (Reeve, 1854); Colombia (Deshayes, 1855).

Description: Medium-sized for genus, to 42mm (CAS 024450; Tumaco, Colombia); rhomboidal, length 1.3 times height (sd, ± 0.1); moderately inflated, thickness 0.60 times height (sd, ± 0.03); valves heavier on an average than those of either *Donax assimilis* or *D. dentifer*; anterior end longer, somewhat pointed; posterior end short, often with a shallow indentation, giving it a rostrate appearance; posterior margin almost straight; posterior end set off by a sharper angle than in *D. assimilis*; posterior end somewhat flattened; beaks more inflated than in *D. assimilis*; ventral margin a little flexed below beaks and indented posterior to this.

Radial ribs flat on central and anterior slopes, becoming obsolete toward and on posterior slope, closer together where ventral margin is indented; concentric sculpture present on posterior end, producing a network pattern; the stronger sculpture on posterior slope tending to end more abruptly toward central slope than in *Donax assimilis*.

Left valve with cardinals of nearly equal size; anterior lateral short, closer to beaks and more ventrally directed than that in *Donax assimilis*; posterior lateral short, about equidistant. Right valve with a large posterior cardinal and a small anterior cardinal; anterior lateral on sub-marginal ridge, close to cardinals, ventrally directed; posterior lateral on a sub-marginal ridge, about equidistant.

Externally purple to tan; internally purple to white.

Distribution & Habitat: Playa el Tamarindo, near Punta Ampala, Gulf of Fonseca, El Salvador (about 13°9'N; 87°52'W) (CAS 024447 & 024449), to Caleta La Cruz, near Zorritos, Tumbes Prov., Peru (about 3°37'S; 80°34'W) (ANSP 236397, 234766, & 234862). The habitat information available on labels is scant. Occurrence seems to be in the intertidal area on sand beaches, though two labels have it in mangrove areas. I have seen 85 lots.

There is a lot in the ANSP (#51576) labeled as coming from Callao, Lima Prov., Peru (12°3'S; 77°10'W). This is not confirmed by other records, and I think it is prob-

ably incorrect. I have not located the specimens reported by HERTLEIN & STRONG (1949: 252) from Bahía Tangola-Tangola, Oaxaca, Mexico. I suspect the record was based on a misidentification.

(*Machaerodonax*) Römer, 1870

[Type species: *Donax scalpellum* Gray, 1825; by SD of DALL, 1900]

Anterior end longer, deflected dorsally; posterior end short, truncate, pointed ventrally, with multiple folds; posterior slope sharply set off, generally by a carina.

Left valve with widely divergent cardinals of nearly equal size; posterior lateral below hinge margin. Right valve with a large, bifid posterior cardinal; anterior lateral fitting beneath that of left valve; posterior lateral socket with teeth both above and below slot for posterior lateral of left valve.

I am here redefining the concept of this subgenus. Rather than using *Machaerodonax* to encompass several species with elongate, somewhat gaping shells, which was Römer's basis for grouping the four species he included, I recognize an alternative set of three species with what I regard as more fundamental similarities. In addition to the type species, which occurs in the Gulf of Aden, I include the West American *Donax carinatus* and *D. transversus*.

Donax (Machaerodonax) carinatus Hanley, 1843

(Figures 24, 25, 26)

Donax carinatus Hanley, 1843

HANLEY, 1843a-1844: 84; 9 (plt. expl.); plt. 14, fig. 28 [as *D. "carinata"*]

HANLEY, 1843b: 5-6 [as *D. "carinata"*]

REEVE, 1854: plt. 2, fig. 4 [as *D. "carinata"*]

CARPENTER, 1857b: 208, 232, 245, 285, 304

CARPENTER, 1857c: 43

CARPENTER, 1864b: 537, 552, 668 [1872: 23, 38, 154]

SOWERBY, 1866: 305; plt. 1 [= 280], figs. 4, 5

Explanation of Figures 22 to 27

Figures 22 to 23: *D. asper* Hanley. Figure 22: lectotype (herein) of *D. asper* Hanley, length 42.6 mm. Figure 23: lectotype (herein) of *D. granifer* Reeve, length 18.5 mm

Figures 24 to 26: *Donax (Machaerodonax) carinatus* Hanley. Figure 24: holotype of *D. carinatus* Hanley, length 30.3 mm. Figure 25: holotype of *D. rostratus* C. B. Adams, length 52.0 mm. Figure 26: lectotype of *D. culminatus* Carpenter, length 23.8 mm

Figure 27: *D. (Machaerodonax) transversus* Sowerby, a specimen from Estero El Tamarindo, El Salvador; CAS 028712, length 27.3 mm

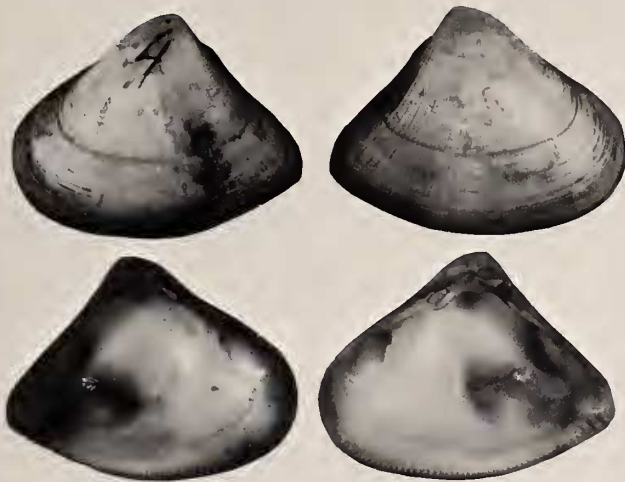


Figure 22

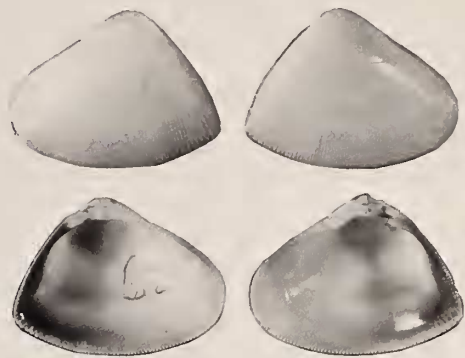


Figure 23

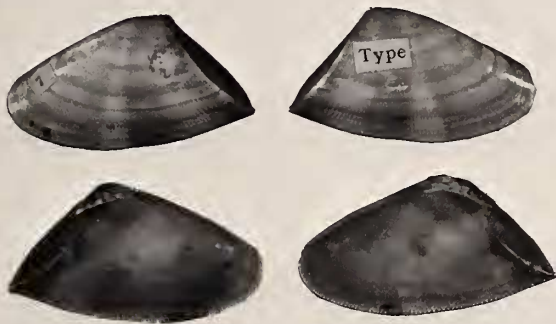


Figure 24

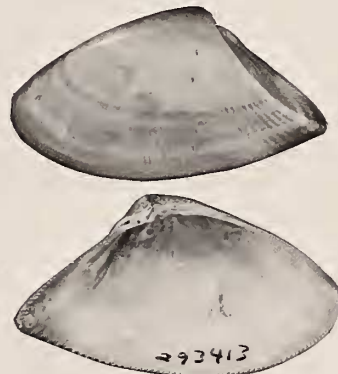


Figure 25



Figure 26



Figure 27

- TRYON, 1869: 111
 RÖMER, 1869b-1870: 10-11; 119 (plt. expl.); plt. 3, figs. 4-6
 BERTIN, 1881: 80
 SMITH, 1944: 63; fig. 820
 HERTLEIN & STRONG, 1949: 253; 258 (plt. expl.); plt. 1, fig. 9
 KEEN, 1958: 184, 185; fig. 446
 OLSSON, 1961: 342-343; 533 (plt. expl.); plt. 60, figs. 4-4b
 KEEN, 1971: 235, 236; fig. 585
Donax rostratus C. B. Adams, 1852
 C. B. ADAMS: 1852a: 502-503, 545 [1852b: 278-279, 321]
 CARPENTER, 1857b: 229, 245, 279, 304, 364
 CARPENTER, 1857c: 548
 MÖRCH, 1860: 193
 CARPENTER, 1864a: 366 [1872: 202]
 CARPENTER, 1864b: 537, 541, 552, 668 [1872: 23, 27, 38, 154]
 TRYON, 1869: 111
 RÖMER, 1869b-1870: 11-12; 119 (plt. expl.); plt. 3, figs. 1-3
 BERTIN, 1881: 81
 TURNER, 1956: 82
Donax culminatus Carpenter, 1857
 CARPENTER, 1857b: 229, 245 [nomen nudum; as = *D. rostratus*]
 CARPENTER, 1857c: 43-44, 548 [as = *D. rostratus* on p. 548]
 CARPENTER, 1864a: 366 [as = *D. carinatus*] [1872: 202]
 CARPENTER, 1864b: 552 [as = *D. carinatus*] [1872: 38]
 TRYON, 1869: 111 [as = *D. carinatus*]
 KEEN, 1958: 184 [as = *D. carinatus*]
 PALMER, 1963: 312
 KEEN, 1968: 399; 402 (plt. expl.); plt. 56, figs. 33a, b [as = *D. carinatus*]
 KEEN, 1971: 236 [as = *D. carinatus*]

Type Material & Localities:

- D. carinatus*—BM(NH) 1900.2.8.4, presumably the holotype, pair; length, 30.3 mm; height, 17.0 mm; thickness, 10.8 mm (Figure 24).
 Loc. unknown (HANLEY, 1843a, 1843b).
D. rostratus—MCZ 293413, probable holotype, left valve; length, 52.0 mm; height, 27.9 mm; thickness, 10.0 mm (Figure 25).
 TURNER (1956: 82) believed this specimen to be lost. Indeed, it was not labeled with the name *D. rostratus*, and its length in particular differs significantly from that given by Adams (length, 40.6 mm; height, 29.2 mm; thickness, 20.3 mm, evidently calculated to represent a pair of matched valves). However, I suspect that his measurements were incorrect or were miscopied, for they would depict a *Donax* with proportions that would not match any specimens of *D. carinatus*, to which Adams' description fits closely otherwise. The specimen was labeled "Panama; CBA!" and could not be any other species of *Donax* in Adams' catalogue of Panama mollusks; all the rest are accounted for. Moreover, a tracing in the margin of Carpenter's copy of Adams's book strongly indicates that this is the specimen Carpenter took to be the type specimen of *D. rostratus*.
 Panama; C. B. Adams. Presumably from near Panama City, Panama (about 8°58' N; 79°32' W); between Nov. 27, 1850, and Jan. 2, 1851.
D. culminatus—BM(NH) Mazatlán Coll. 1857.6.4.139, lectotype (KEEN, 1968), pair, the only specimen from Mazatlán (there

are two paralectotypes in the lot from Central America); length, 23.8 mm; height, 12.5 mm; thickness, 8.6 mm (Figure 26).

Mazatlán, Sinaloa, Mexico (23°12' N; 106°25' W); F. Reigen.

Description: Medium-sized for genus, to 52 mm (probable holotype of *Donax rostratus*, MCZ 293413; MCZ 293415, Nicaragua); rhomboidal-elongate, length 1.7 times height (sd, ± 0.04); moderately inflated, thickness 0.60 times height (sd, ± 0.01); anterior end longer, somewhat pointed and deflected dorsally; posterior end short, sharply pointed, somewhat truncate ventrally; postero-dorsal slope with multiple folds (less so than in *D. transversus*); posterior slope set off by a sharp carina in most specimens.

Most of surface smooth, with radial ribs evident only by the striae between them; posterior slope with fine, raised radial ribs, which are reticulated by concentric sculpture in most specimens.

Left valve with widely divergent cardinals of nearly equal size; anterior lateral close to beaks; posterior lateral more distant, on a submarginal ridge. Right valve with a large, bifid posterior cardinal and a thin anterior cardinal; anterior lateral close to beaks, fitting beneath that of left valve; posterior lateral socket with teeth both above and below slot for posterior lateral of left valve.

Externally tan with concentric and radial bands of darker color; purple within.

Distribution & Habitat: Altata, Sinaloa, Mexico (24°32' N; 107°50' W) (USNM 63671; CAS 024808), and Bahía Magdalena, Baja California Sur (about 24°38' N; 112°09' W) (AMNH 106015), Mexico, to Puerto Pizarro, Tumbes Prov., Peru (3°30' S; 80°25' W) (USNM 537987). OLSSON (1961: 339) reports the species from Mancora, Tumbes Prov., Peru (4°6' S; 81°4' W); I have not seen his specimens, but there is no reason to doubt this record. There is a lot in the MCZ (#260064) labeled as coming from Estero de Tastiota, Sonora, Mexico (about 28°24' N), much farther north than any other lot from this well-studied area. I suspect an error has crept into this material from PARKER's 1964 study, for he reports the species (pp. 161, 167; plt. 2, fig. 19) from only one station (#160), that south of Mazatlán. There is a single lot labeled as coming from Pisco, Ica Prov., Peru (13°44' S) in the AMNH (#149964), which would represent an extremely southern record. I would regard this lot, too, as questionable unless additional specimens are taken this far south. Intertidal area to 12m, sand. I have seen 72 lots.

Discussion: CARPENTER (1857c) reported *Donax carinatus* from Mazatlán, and he described a new species, *D. culminatus*, from there as well. But, in the errata to this book (p. 548), Carpenter concluded that this new species was the

same as *Donax rostratus* described by C. B. Adams from Panama in 1852. Then, after Carpenter had had a chance to see Adams' unique holotype, he concluded that *Donax rostratus* was instead identical to what he had previously thought was *D. carinatus* Hanley, and that his *D. culminatus* was identical with Hanley's *D. carinatus* (CARPENTER, 1864a: 366). In fact, Adams himself had compared *D. rostratus* with *D. carinatus* (misspelled as *D. "cardinatus"*).

The type of *Donax rostratus* and the specimens that Carpenter isolated in 1857—from Mazatlán and elsewhere—and associated with Adams' *D. rostratus* in 1864 are truly unique specimens of *D. carinatus*. (Carpenter's Mazatlán specimens are in the BM(NH), #1857.6.4.138.) They lack a sharp posterior keel, and the posterior slope lacks the concentric sculptural elements that roughen the radial sculpture of typical *D. carinatus*, having instead smooth, shiny radial ribs. In other respects, they are identical to *D. carinatus*. There are similar specimens from throughout the distribution of the species—Mazatlán (MCZ 87325), Nicaragua (MCZ 293415), and Ecuador (MCZ 233580), for example. I suspect that this set of characters is a common genetic variation.

The originally stated height of the type of *D. rostratus* (29.2 mm) would suggest a specimen much higher in proportion to the length that Adams gave than any specimens of *D. carinatus* I have seen. (And, as stated above, I think that this last measurement was in error and that the specimen in the MCZ is actually his unique holotype.) OLSSON (1961: 338-339; 534; plt. 61, figs. 1-1b) was led astray by these measurements and said he was "fairly certain" of what Adams had from Panama, and he figured a high juvenile of *D. asper* from Ecuador to illustrate his concept, a species that does not in any other way fit Adams' description. (What was illustrated as *D. rostratus* by KEEN (1958: 186, 187; fig. 456) is a specimen of the Caribbean *D. striatus* Linnaeus, 1767, that had been mislabeled as coming from "Panama.")

Donax (Machaerodonax) transversus Sowerby, 1825

(Figure 27)

Donax transversus Sowerby, 1825

- SOWERBY, 1825: iv [as *D. "transversa"*]
 REEVE, 1854: plt. 6, fig. 36 [as *D. "transversa"*]
 CARPENTER, 1857b: 174, 245, 304
 CARPENTER, 1857c: 44, 548
 CARPENTER, 1864b: 537, 668 [1872: 23, 154]
 SOWERBY, 1866: 306; plt. 1 [= 280], fig. 11
 TRYON, 1869: 114
 RÖMER, 1870: 79-80; 120 (plt. expl.); plt. 14, figs. 1-3
 BERTIN, 1881: 107
 HERTLEIN & STRONG, 1949: 256; 258 (plt. expl.); plt. 1, fig. 3

KEEN, 1958: 186, 187; fig. 457

OLSSON, 1961: 345; 532 (plt. expl.); plt. 59, figs. 4-4b

KEEN, 1971: 239, 241; fig. 599

[not to be confused with *D. transversus* Deshayes, 1830—see discussion under *Donax (Paradonax)* below]

Donax scalpellum Gray, auctt., non Gray, 1825

HOFFSTETTER, 1952: 42

[non GRAY, 1825: 136]

Type Material & Locality:

D. transversus—BM(NH) 1839.6.10.17, probable holotype, pair; length, 36.5 mm; height, 14.7 mm; thickness, 9.5 mm (located after manuscript submitted; not illustrated).

No locality was given by SOWERBY (1825), or by REEVE (1854), who was the first person to illustrate the species, an illustration undeniably of the West American species. CARPENTER (1857b, 1857c) was the first to attribute the species to the Panamic Province. The original board with the newly located type says "San Blas," Nayarit, Mexico (21°32' N; 105° 19' W).

Description: Medium-sized for genus, to 42 mm in length (CAS 024443; Acapulco, Mexico); elongate, length 2.3 times height (sd, ±0.2); not very inflated, thickness 0.56 times height (sd, ±0.05); anterior end much longer, produced dorsally, the postero-dorsal slope concave; posterior end short, very truncate, pointed ventrally, with multiple folds; posterior slope set off by a sharp carina.

Most of surface smooth, with radial ribs visible only as striae, but posterior slope with fine, raised radial ribs reticulated by concentric sculpture. Periostracum not evident.

Left valve with widely divergent cardinals of nearly equal size; anterior lateral close to beaks; posterior lateral more distant, on a ridge below dorsal margin. Right valve with a large, bifid posterior cardinal and a thin anterior cardinal; anterior lateral close to beaks, fitting beneath that of left valve; posterior lateral socket with teeth both above and below slot for posterior lateral of left valve.

Externally with tan or brown radial bands; internally purple, often with radial bands corresponding to the external bands.

Distribution & Habitat: Altata, Sinaloa, Mexico (24°32' N; 107°50' W) (USNM 63672), to Cabo Blanco, Piura Prov., Peru (4°17' S; 81°16' W) (CAS 024816). OLSSON (1961: 345) cites the species from Paita, Piura Prov., Peru (5°5' S; 81°07' W); while I have not seen his specimens, I accept this record. The only habitat noted on labels is intertidal sand. I have seen 39 lots.

Discussion: *Donax scalpellum* Gray, 1825, was described without a type locality. REEVE (1854) attributed it to the "Gulf of California" and SOWERBY (1866) to "California." These incorrect localities have echoed through the literature and the name evidently applied to specimens of *D.*

transversus, but the only published record unquestionably based on a specimen of *D. transversus* is that of HOFFSTETTER (1952). Gray's species, however, is native to the Gulf of Aden (see HERTLEIN & STRONG, 1949: 256). (*Donax elongatus* MAWE, 1823: 39; 37 (plt. expl.); plt. 9, fig. 6, an earlier name for *D. scalpellum*, is a homonym of the West African *D. elongatus* LAMARCK, 1818: 550.)

(*Amphichaena*) Philippi, 1847

[Type species: *A. kindermanni* Philippi, 1847b; by M]

Relatively thin-shelled, with radial striae; punctations lacking. Pallial sinus does not reach anteriorly past beaks. The valves gape at ends.

Left valve with two cardinals, the anterior larger; anterior lateral very close to cardinals (so close it has been mistaken for a third cardinal); posterior lateral scarcely evident. Right valve with two cardinals, the posterior larger; anterior lateral close to beaks, on a ridge below dorsal margin; posterior lateral scarcely evident.

There has been some speculation that this genus might belong in the Psammobiidae (GIEBEL, 1864: 146; KEEN, in Cox, *et al.*, 1969: N631), based on its smooth, gaping shell. However, I agree with OLSSON (1961) and KEEN (1971) in assigning it to the Donacidae based on its hinge, internal crenulations, and virtual indistinguishability from some other donacids. Its soft parts seem very similar to other donacids (CAS 028716).

Donax (Amphichaena) kindermanni (Philippi, 1847)

(Figures 28, 29, 30)

Amphichaena kindermanni Philippi, 1847

PHILIPPI, 1847b: 63-64; plt. 3, figs. 7

CARPENTER, 1857b: 297

GIEBEL, 1864: 146 [as *Psammobia*]

PALMER & HERTLEIN, 1936: 71-72; 80 (plt. expl.); plt. 18; plt. 19, figs. 5-10 [as *Amphichaena*]

KEEN, 1958: 188-190; fig. 463

OLSSON, 1961: 345-346 [as = *D. (Amphichaena) culter*]

KEEN, 1971: 239, 241; fig. 600 [as *Amphichaena*]

Donax petallinus Reeve, 1854, ex Deshayes MS

REEVE, 1854: plt. 8, fig. 51 [as *D. "petallina* Deshayes"]

DESHAYES, 1855: 350 [as *D. "petalina"*]

SOWERBY, 1866: 315; plt. 3 [= 282], fig. 86

RÖMER, 1870: 51-52; 119 (plt. expl.); plt. 9, figs. 7-10

DALL, 1909: 273

Donax petalina, *auctt.*, a misspelling

Amphichaena gracilis Mörch, 1860

MÖRCH, 1860: 192

KEEN, 1966b: 14; 12 (plt. expl.); figs. 15, 15a

[non *Donax gracilis* Hanley, 1845]

Type Material & Localities:

Amphichaena kindermanni—Evidently lost, for it is in neither Berlin's Humboldt Museum (Kilius, *in litt.*, 8 Aug. 1980) nor in the Museo Nacional de Historia Natural in Santiago, Chile (Bahamonde, *in litt.*, 16 April 1981). There is no need of a neotype; the original illustration is unmistakable. Philippi's specimen measured 30mm in length, 8.2mm in height, and 8mm in thickness.

The type specimen was said to have come from Mazatlán, Sinaloa, Mexico (23°12'N; 106°25'W), by way of a Mr. Kindermann of Valparaiso, Chile, but there is no material from as far north as Mazatlán in any of the collections I have examined. The farthest north I have seen specimens is Bahía Tenacatita, Jalisco, Mexico (see "Distribution" below). Given the early date of Philippi's material, a lack of precision would not be unexpected. A more likely station would have been Acapulco, Guerrero, Mexico.

Donax petallinus—BM(NH) 198221—lectotype herein, right valve, the specimen figured by Reeve; length, 13.9mm; height, 6.3mm; thickness, 1.8mm (Figure 28). Paralectotypes, one pair and two left valves. KEEN (1966b: 15) suggested that three of the type specimens could be identified with *Donax culter*. I have examined all of this material, and it represents *D. kindermanni*.

Locality unknown (REEVE, 1854: DESHAYES, 1855; SOWERBY, 1866). It may have come from the Acapulco area (16°51'N; 99°56'W), where the species is common.

Amphichaena gracilis—Univ. Zool. Mus., Copenhagen, lectotype herein, the intact left valve; length, 13.4mm; height, 5.4mm; thickness, 1.7mm (Figure 29). Paralectotypes, 3 broken right valves, 3 broken left valves, 1 intact right valve.

Sonsonate [Prov.], El Salvador. The specimens may have come from the port of Acajutla (13°35'N; 89°50'W).

Description: Medium-sized for genus, to 48mm in length (CAS 025751; Petatlán, Guerrero, Mexico); elongate, length 2.6 times height (sd, ±0.2); moderately inflated, thickness 0.59 times height (sd, ±0.03); approximately equilateral; anterior end produced; posterior end broadly truncate; beaks small; external ligament elongate; central slope indented ventral to beaks; surface smooth or with rounded, raised striae that are most prominent and more closely spaced on posterior slope, where they are sometimes lightly reticulated by irregular concentric lines; radial ribs becoming obsolete on anterior slope; rarely with only concentric lines evident on posterior slope. Periostracum present only as a marginal fringe. Pallial sinus broad.

Left valve with two cardinals, the anterior larger; anterior lateral very close to cardinals; posterior lateral distant, scarcely evident. Right valve with two cardinals, the posterior larger; with an anterior lateral close to beaks, on a submarginal ridge; posterior lateral scarcely evident.

Externally white, tan, and purple, with one or two light and dark radial bands and sometimes darker concentric bands.

The available type material being juvenile specimens, I have illustrated an adult in Figure 30.

Distribution & Habitat: Bahía Tenacatita, Jalisco, Mexico (19° 16' N; 104° 52' W) (CAS 025752), to Costa del Sol, Dept. la Paz, El Salvador (13° 26' N; 89° 9' W) (CAS 028715); Playa el Tamarindo, near Punta Ampala, Gulf of Fonseca, El Salvador (about 13° 9' N; 87° 52' W) (HERNÁNDEZ, 1979: 205), specimens not seen in this study, but record accepted. There is one lot in the ANSP labeled as having come from the "Gulf of California" (ANSP 51578), but I doubt this record. There is one lot in the USNM (#133771) labeled as coming from Panama, but there are no other specimens from this far south in collections, and I suspect that this is an error. The only habitat noted on labels is intertidal sand. I have seen 39 lots.

One of the largest lots examined (CAS 025751, from Petatlán, Mexico) contained beach-worn specimens in fairly good condition (Figure 30). It contains 47 right valves and 87 left valves. (A Chi-Square test shows that this would occur by chance only once in more than 1000 times; $\chi^2 = 11.94$). One wonders why such non-random sorting of valves takes place.

Discussion: Southern populations of *Donax (Chion) culter* approach the morphology of *D. (Amphichaena) kindermanni*, a fact first noted by KEEN (1966b: 15), who suggested a number of criteria for separating the two. Unfortunately, both species are somewhat variable and change shape as they grow, so some of the criteria she gives won't work with all specimens. (Moreover, the subgeneric units are poorly defined, and it is not impossible that there is or has been some hybridization between the two.) The following table presents the characters I have found most reliable:

Donax petallinus, named from an unknown locality, was first attributed to the eastern Pacific by BERTIN (1881: 94), who thought it came from Chile. BALES (1938) reported it from Acapulco, which may be close to the place from which Reeve's specimens actually came. I have seen no specimens of this species from South America, so what Bertin had—and what was later reported under this name by GIGOUX (1935: 284) from Atacama, Chile—remains a mystery. The checklist of CARCELLES & WILLIAMSON (1951: 344) also records this taxon from "Chile and Peru." The *D. petallinus* reported by PARKER (1964) from the coast of Hermosillo, Mexico, are *D. punctostriatus* (MCZ 260123).

	<i>Donax (Amphichaena) kindermanni</i>	<i>Donax (Chion) culter</i>
Shape		
juvenile	slightly longer posteriorly, narrowed anteriorly	longer, broad anteriorly
adult	about equilateral	longer anteriorly (almost equilateral in some)
Gape	valves gaping	very little gape
Sculpture	with radial striae, never punctations	with radial sculpture, punctations in nearly all
Hinge	anterior lateral <i>very close</i> to cardinals;	anterior lateral near to but not <i>very close</i> to cardinals;
(left valve)	posterior lateral scarcely evident	posterior lateral evident
Beaks	small	prominent
Pallial sinus	short, not reaching to below beaks	long, reaching to below beaks
Interior ventral margin	smoother in center	denticulate throughout

Explanation of Figures 28 to 33

- Figures 28 to 30: *Donax (Amphichaena) kindermanni* (Philippi). Figure 28: lectotype (herein) of *D. petallinus* Reeve, length 13.9 mm. Figure 29: lectotype (herein) of *A. gracilis* Mörch, length 13.4 mm. Figure 30: a specimen from Laguna Potosi, Zihuatanejo, Guerrero, Mexico; CAS 028713, length 35.4 mm
- Figure 31: *D. (Paradonax) californicus* Conrad, lectotype of *D. navicula* Hanley, length 24.9 mm
- Figure 32: *D. (Paradonax) gracilis* Hanley, lectotype (herein), length 25.1 mm
- Figure 33: *D. (Paradonax) punaensis* Pilsbry & Olsson, holotype, length 24.7 mm